

(NASA-CR-198694) [THE DEVELOPMENT
OF STATISTICAL METHODS FOR TIME
SERIES ANALYSIS WHEN SAMPLING IS
IRREGULAR] Final Technical Report
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Final Technical Report for NAG 5 - 1194
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The subject matter of this grant was the development of statistical methods for time series analysis when the sampling is irregular. Ordinary Fourier and correlational methods encounter a number of special problems when the sampling interval is not held constant, and yet this case is endemic to astronomical observations. As part of the algorithms and databases segment of the NASA ADP program, this grant was intended to support development of these methods, testing of the algorithms by simulation and application to real problems, and distribution of user-friendly codes implementing these methods to the space astronomy community.

Before this grant began we invented the Discrete Correlation Function as a means of calculating cross-correlation functions for unevenly sampled data, and developed a privately-held computer code to implement it. With the support of this grant we have:

- introduced differential weighting dependent on data quality;

- removed the constraint present in our initial implementation which required the two time series to be taken at the same times,

- written a new implementation suitable for data sets so large that they strain the memory limits of popular computer workstations;

- written a new implementation appropriate to data sets so large that they require analysis on vector architecture supercomputers;

- written a new implementation which, in certain applications, increases the speed of operation by an order of magnitude

- improved the clarity of input-output procedures and commented the source code so that inexperienced users can run our code with supervision;

- done simulational testing to check the uncertainty estimates arrived at by analytic arguments in our original paper;

- investigated related methods for computing Fourier power spectra (work still in progress);

- and distributed appropriate versions of the code to many space astronomers.

In addition, we have applied our techniques of time series analysis to the *IUE* archive of Seyfert galaxy observations, the *IUE* campaign to monitor NGC 5548, Seyfert galaxy X-ray light curves, and the distribution of X-ray pulsar periods in external galaxies.

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